Chapter 7

5 A Day Program Evaluation Research

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INTRODUCTION

It is a challenge to evaluate the 5 A Day Program of the National Cancer Institute (NCI). As previous chapters have indicated, the Program is a complex weave of multiple components with many stakeholders. It is a program designed at the national level, operationalized at the State level, and implemented at the community and local levels, making data collection difficult. Funding and staffing have been variable and largely insufficient. Initiatives have varied in geographic location, complexity, quality, sustainability, and measurability. For these reasons, the 5 A Day staff needed to find creative ways to monitor Program growth, capture initiatives of the many licensees, and ultimately produce credible measures of effectiveness.

A vision for a comprehensive Program evaluation was an integral part of the planning, but funds were not available to implement the plan until 3 years after Program initiation. Therefore, initial efforts were minimal, expanding as funds became available. This chapter provides an overview of the attempt to evaluate all Program components.

EVALUATION OVERVIEW

The original 5 A Day evaluation plan consisted of two major components: process and outcome evaluations (see Table 1). The aims of the process evaluation were to track Program growth and implementation, to identify factors associated with successful initiatives, and to develop small studies that would establish credible linkages between Program implementation and outcomes. The plan was to evaluate industry participation by tracking growth in the membership of NCI's private-sector partner, the Produce for Better Health Foundation (PBH); collecting retail activity reports from supermarkets; and tracking sales of materials purchased by industry through the PBH publisher. Growth in numbers of States requesting licenses and the activities of State licensees would be tracked through

Table 1. 5 A Day Program Evaluation

Level I—Process Evaluation
Program Infrastructure Growth: States
Program Infrastructure Growth: Industry
Study Correlating State Implementation Data and Vegetable and Fruit Intake
State Case Studies
Case Study Results
Media Analysis

Level II—Outcome Evaluation
5 A Day Message Awareness
Evaluation of State-Level Interventions
Results of State-Level Interventions
Baseline and Followup Surveys
Channel-Specific Community Research Grants

State activity reports. Therefore, tracking growth was possible with no evaluation funds, because staff developed, collected, and analyzed the State reports. Funds dedicated to media were used by NCI and PBH to hire a clipping service to track 5 A Day articles and advertising. However, the substudies planned for this portion of the evaluation (such as the correlation of implementation with outcomes) had to be delayed until funds were available.

The aims of the outcome evaluation were to measure changes in population awareness, knowledge, stages of change, and mean consumption between baseline and followup national surveys; to determine the effect of the Program on target populations in certain channels through the implementation of nine grants with randomized designs (see Chapters 8 to 11); and to develop a series of common questions for use across grantees and by other licensees to measure Program impact. When funds became available for evaluation in 1994, another component was added: 1-year grants were provided to States to evaluate interventions in specific channels or settings.

LEVEL I—PROCESS EVALUATION

The process evaluation activities included documenting growth of the 5 A Day Program and analyzing media data. Activities also included the substudies mentioned above, such as developing a program intensity index from the State activity reports and conducting qualitative studies of State programs. As in most process evaluations, the objectives were to measure progress in implementing the program over time, to describe the various ways in which States have implemented the Program, and to determine which approaches seem successful (Rossi and Freeman, 1993). The latter objectives are particularly important for the 5 A Day Program, which allows, and even encourages, creative and varied program versions that seem best suited to the individual States and local community structures.

Program Infrastructure Growth: States

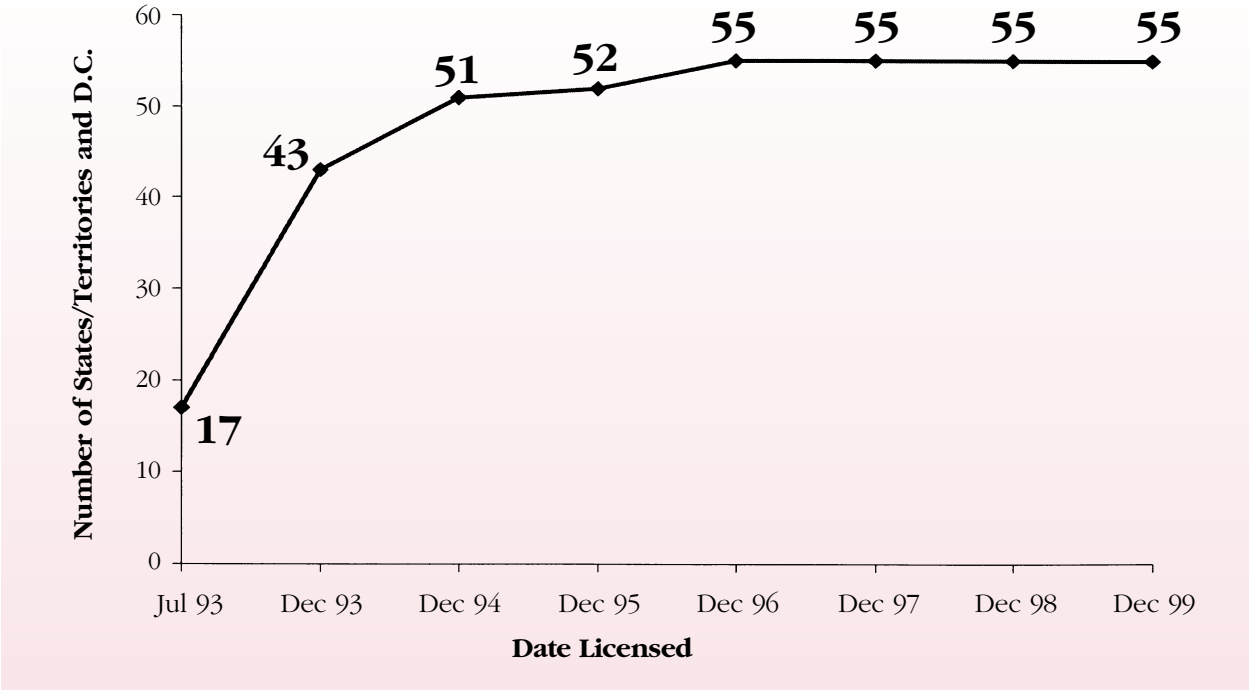
To operationalize the program at the community level, NCI licensed all State and territorial health agencies (SHAs) to conduct activities under the 5 A Day Program (see Chapters 3 and 4). SHAs in turn use State, county, or local coalitions to implement the 5 A Day Program. State coordinators (one per SHA) are required to report on their 5 A Day activities every 6 months. To facilitate the reporting process, NCI developed a State activity report form. The first reports were completed in December 1993 for a reporting period that covered the previous 6 months. The reporting form, completed by the State coordinator, provides information on 1) overall activities conducted by the SHA and its sublicensees, 2) the organizational structure, and 3) program resources and expenditures. In addition, a separate activity tracking form is completed for each 5 A Day activity conducted in a State during March (National Nutrition Month) and September (National 5 A Day Week).

NCI licensed the first group of 17 States in 1993. By January 1996, NCI had licensed all 50 states, 4 of the 6 U.S. territories, and the District of Columbia (See Figure 1). Within a little more than a year, almost all SHAs were licensed with a 5 A Day coordinator appointed by the State health officer. The uptake of the 5 A Day Program was rapid. According to the Diffusion of Innovations Theory, the nutritionists and health officers of the SHAs could be termed early adopters of the 5 A Day innovation (Rogers, 1983; Goodman et al., 1997).

In 1996, NCI licensed the health promotion programs of the military services and of the Indian Health Service. These programs serve two very large groups of Americans who were not being reached via the State 5 A Day programs; therefore, it was necessary to create a formal license agreement with the health professionals of these services. Although the potential for impact is great in these populations, evaluation data have not been collected from these services.

The State activity reports have yielded critical information about how the State programs function. Approximately 80 percent of States currently use statewide coalitions to implement their 5 A Day efforts. Most States are using either preexisting or specifically created statewide coalitions to implement the program. Only about one-third of the States currently use local or county coalitions. Data from 1998 showed that fewer than five States were implementing the program without the use of a State, county, or local coalition. Coalition participants include State and county health agencies, State departments of education and agriculture, U.S. Department of Agriculture (USDA) Cooper-

Figure 1. Growth of 5 A Day State/Territorial Health Agency Licensees



ative Extension Service providers, voluntary agencies, businesses, hospitals, and State dietetic associations. These coalitions conduct a variety of interventions designed to reach the American public, using advertising campaigns, implementing retail promotions and educational activities, distributing recipes, and sponsoring channel-specific educational efforts and community events.

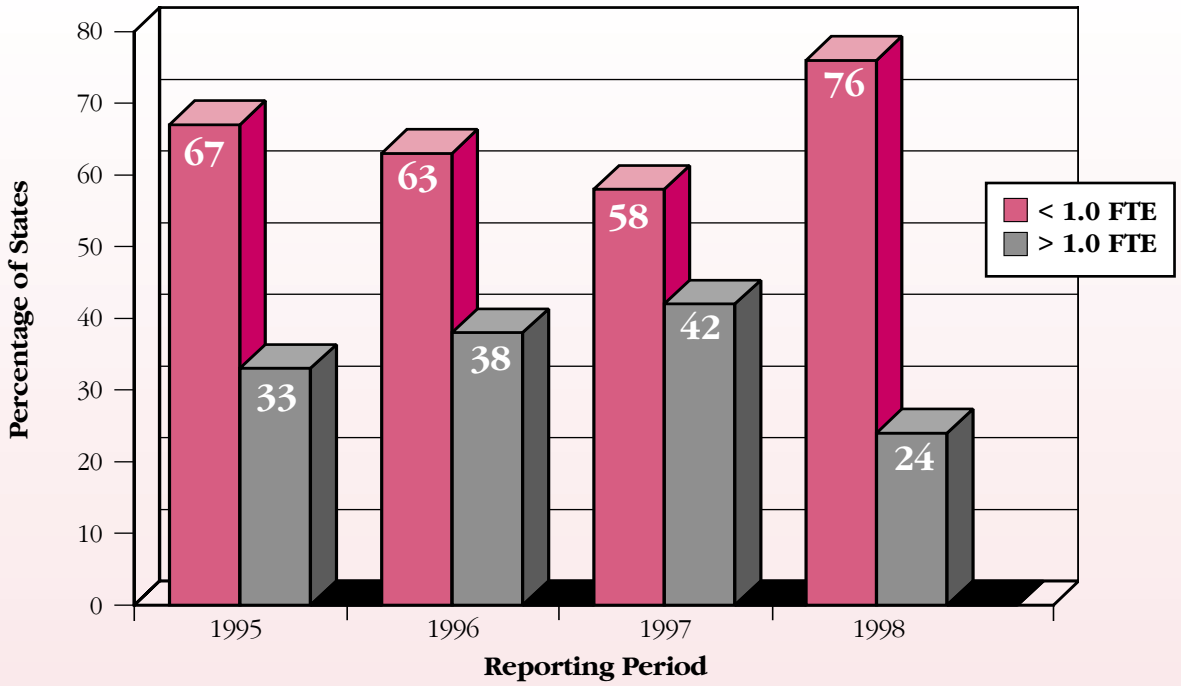
About one-third of the SHAs had more than one full-time equivalent (including professional, clerical, and State coordinator staff) working each year on 5 A Day, although this has decreased recently (as of 1998) to approximately one-fourth of the SHAs. About one-fifth of the States spend 10 percent or less of one full-time equivalent hours (40-hour work week) on 5 A Day. Less than one-third of State coordinators spend 50 percent or more of one full-time equivalent hours on 5 A Day. Usually, States that had more than one full-time equivalent were those that allocated larger budgets toward 5 A Day activities. Across all SHAs, State coordinator time accounts for about one-third of the total staff time spent on 5 A Day activities, clerical staff time a little less than one-fourth, and other professional staff time a little less than one-half. Figure 2 displays a nationwide average of SHA staff time spent on 5 A Day efforts, covering the years 1995 to 1998.

NCI did not provide funding for building statewide 5 A Day infrastructures nor was funding provided for implementing any Program activities. State 5 A Day programs either garnered State or private funds for specific 5 A Day interventions or incorporated the 5 A Day message and social marketing strategies into existing nutrition programming efforts. As a result, some of the limited staff time was dedicated to fundraising rather than implementing behavioral change strategies that might increase vegetable and fruit consumption levels.

From 1995 to 1998, the majority of SHAs (more than 90 percent) reported spending less than $250,000 in funds per year, including funding from NCI or Centers for Disease Control and Prevention (CDC) grants, for 5 A Day efforts (see Figure 3). Total funding (including funding from private,[1] State, and Federal sources) garnered at the State

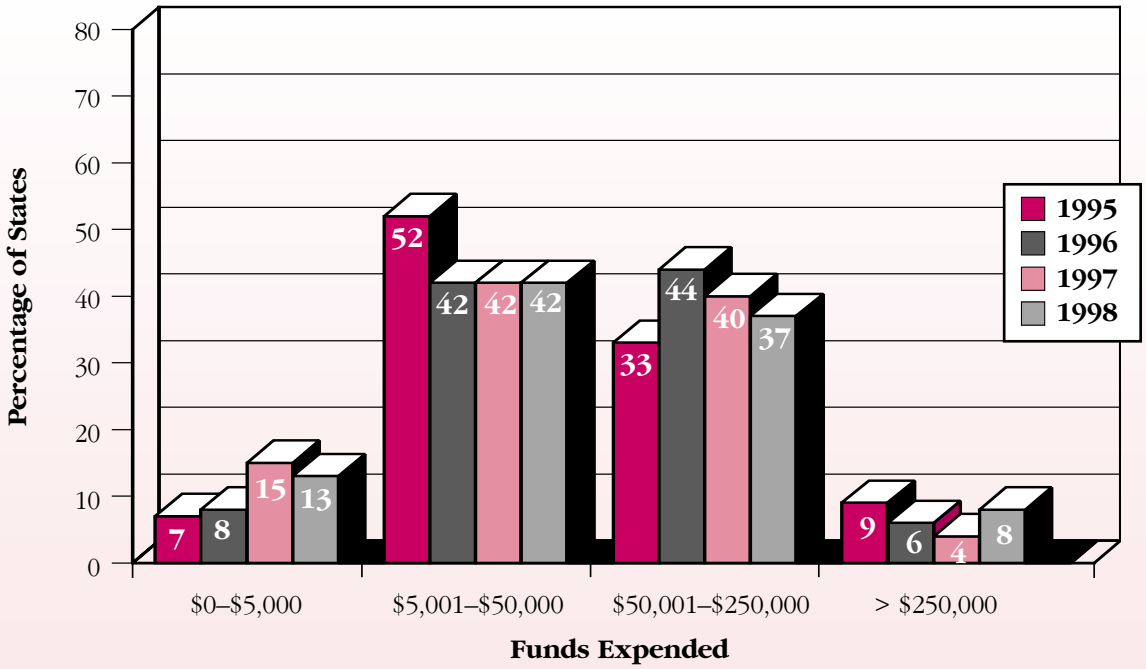
[1] *Private funding includes funds from industry donations, "in-kind" contributions, and other private sources. State funding includes funds from preventive health block grants, USDA Nutrition Education and Training Program funds, and tobacco taxes. Federal funding includes money from CDC or NCI grant funds and other Federal funds.*

Figure 2. SHA Staffing for 5 A Day



Note: Includes professional, clerical, and State coordinator staff time.

Figure 3. State 5 A Day Expenditures [1,2]



[1] Included total State health agency-funded and total CDC/NCI grant-funded expenditures.

[2] Totals exceeding 100 percent are due to rounding.

level for 5 A Day across all SHAs has been about $4.5 million per year. The most frequently cited funding sources are NCI or CDC grant funds, preventive health block grants, and in-kind funding, with more than one-third of States reporting some funding from each of these sources during each reporting period. About one-fourth of the States reported receiving funds from industry donations (Machado and Dietz, 1996, 1997, 1998).

Program Infrastructure Growth: Industry

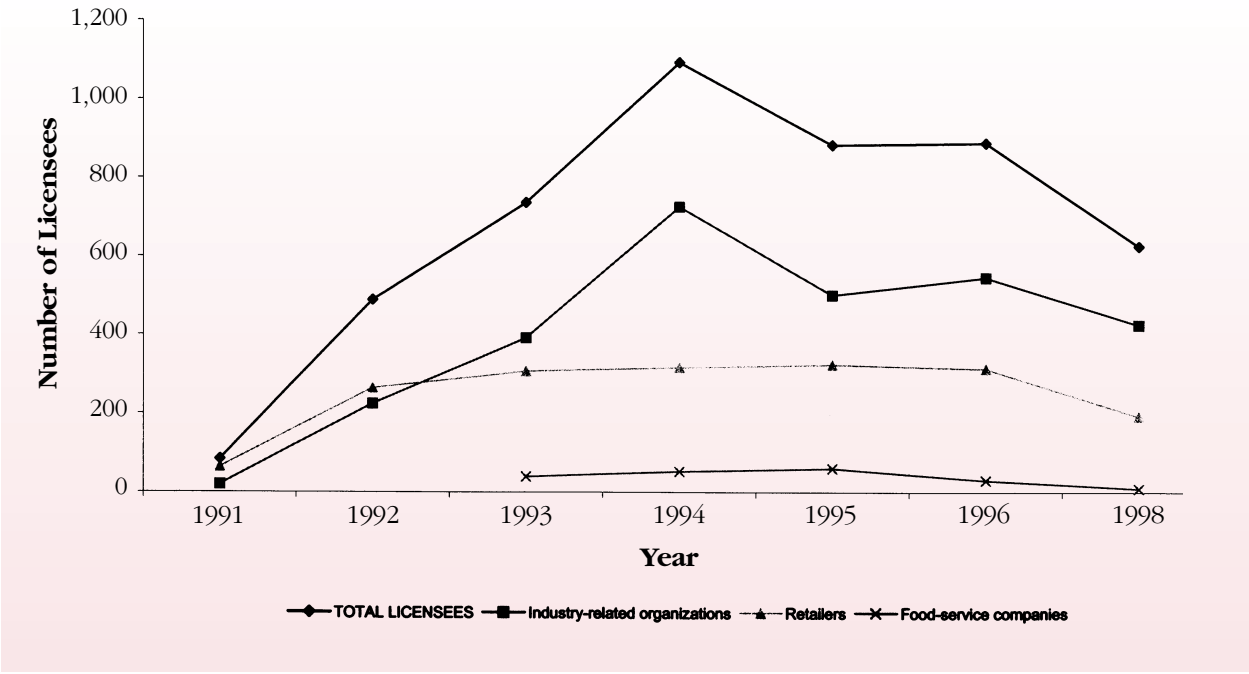
Since 1991, PBH has been responsible for overseeing membership growth in the 5 A Day Program at the industry level. The 5 A Day industry licensees can be grouped into three types of members: retailers (includes supermarkets and grocery stores or chains), industry-related organizations (includes growers, shippers, suppliers, branded products, merchandisers, and commodity boards), and food-service companies. By 1994, PBH had licensed more than 1,000 organizations that represented more than 30,000 supermarkets (see Figure 4). From 1994 to 1998, the number of PBH licensees declined, primarily because of a decrease in both retailer and industry-related organization members. These declines are attributable in part to a considerable amount of supermarket chain consolidation as well as less emphasis by PBH on actively recruiting licensees. In previous years, PBH had used retailer and merchandiser activity report forms to document industry promotions and obtain samples of advertisements and materials used. However, these data were hard to collect, and the use of these reports was discontinued in 1996. Although it was hoped that sales data could make a contribution to evaluation efforts, these data also were difficult to obtain. Finally, several specific industry initiatives indicated that 5 A Day promotions could increase sales. (see Chapter 5 for more information on evaluation of industry initiatives).

Study Correlating State Implementation Data and Vegetable and Fruit Intake

Once funding for evaluation became available, a contractor was hired to make use of the data that had been accumulated since program inception. One question of interest was whether 5 A Day program activities were related to changes in diet. To answer this question, associations were examined between State levels of effort and State estimates of vegetable and fruit consumption.

Drawing upon data from the State activity reports cataloged through the years, an

Figure 4. 5 A Day Industry Licensees, 1991-1998



implementation index of State-level efforts was developed. The index is composed of four variables selected for representing variability in implementation among States. These variables are total SHA staff hours, SHA expenditures, print materials used, and ancillary materials used. Data from 47 States in 1995 and 1996, 48 States in 1997, and 38 States in 1998 are being utilized in this analysis. Results will be reported in peer-reviewed journals.

Many States participate in the Behavioral Risk Factor Surveillance Survey (BRFSS), which has the ability to measure various trends, including vegetable and fruit intake rates. Therefore, BRFSS data from 1994, 1996, and 1998 will be used to gauge vegetable and fruit consumption. BRFSS data should allow for analysis at the State level and, possibly, for an examination of change. These data are currently being analyzed, and once estimates of vegetable and fruit intake are available, correlations between State implementation and vegetable and fruit consumption will be examined as part of the evaluation plan.

State Case Studies

Because State agencies had discretion in how 5 A Day was implemented in their States, there was tremendous variation in how the program functioned across the Nation. Therefore, the evaluation plan included some case-study qualitative research methods to reveal the stories behind the numbers reported in the State activity reports.

The case study component of the national 5 A Day Program evaluation process was designed with several major purposes in mind: to provide program descriptions, to assess organizational effectiveness and identify barriers and facilitators to implementation, and to assess changes in strategies over time and highlight potentially replicable best practices. To address these areas, multiple data collection strategies were used. These included 1) individual indepth interviews and focus groups with State coordinators, coalition members, representatives of different segments of the produce industry, and other key players at the State and local levels; 2) a review of documents describing the structure and organization of the program, implementation plans, and other related materials; and 3) semistructured observation of coalition meetings (announced in advance), food demonstrations in participating markets, and other program-related activities or events. Case-study site visits, which typically lasted 3 to 5 days, were conducted in the spring, summer, and early fall of 1996 by teams of two or three researchers.

The onsite, indepth visits were conducted in five selected States: California, Massachusetts, Ohio, Texas, and Utah. To maximize the analytic reach in case-study research, the selection criteria were chosen for their potential to capture differences in critical aspects of the structure and organization of the Program and the context in which it operates (Berkowitz et al., 1996; Patton, 1990). The case-study States were chosen, first, from among those judged to have organizationally viable 5 A Day programs at the State or local level. Second, they were selected to represent a range of variation in demographic and organizational characteristics, such as census region, State population size, racial composition, poverty status, local versus State coalitions, percentage of time commitment by the State coordinator, and other relevant data. Table 2 summarizes 1996 organizational and demographic features for each of the five case-study States.

Case-study data were analyzed both on an in-case basis, to produce individual reports on each site, and on a cross-case basis, to yield a comparative cross-site synthesis of factors affecting program implementation and effectiveness. Both types of analyses were conducted using the Grounded Theory approach. This approach is a systematic and rigorous method (Glaser and Strauss, 1967; Strauss and Corbin, 1990) for identifying recurring patterns or themes in data that are primarily qualitative and for elucidating relationships between complex sets of variables that are relevant to the understanding of Program operations and effectiveness.

Case Study Results

Cross-site analysis revealed a number of factors that facilitated or hampered the startup and ongoing implementation of the State 5 A Day programs. Highlights of the important findings from three factors that contribute to effective public/private partnerships are listed below.

State Agency Factors

- The more operationally successful State programs enjoy some support from persons at high levels of the lead agency.

Table 2. 5 A Day In-Person Case Study States: Organizational and Demographic Features in 1996

Organizational Features	*California*	*Massachusetts*	*Ohio*	*Texas*	*Utah*
Year State Program Initiated	1986[1]	1993	1993	1994	1993
Coordinator (% of full-time equivalent)	100%[2]	20%	20%	20%	25-30%
Structure of State Program	Centralized	Centralized	Decentralized	Decentralized	Centralized
Status of State Coalition	Active	Active	None	Not active	Active
State Health Agency Partnerships	Private and public	Mainly public	None	None	Mainly private, some public
Number of Local Coalitions	None	None	5 (not formal coalitions)	3	2
Demographic Features					
Census Region	Western	Eastern	Midwestern	Southern	Western
Agricultural Production[3]	High	Low	Moderate	High	Low
Relative Population Size, 1993[4]	1	13	7	3	34
Racial/Ethnic Diversity	High	Moderate	Moderate	High	Low
Percentage Below Poverty, 1992[5]	15.0	10.0	12.4	17.8	9.3

[1] Year NCI grant awarded; program actually began in 1988-1989.

[2] State coordinator's role encompassed more than 5 A Day.

[3] State ranks are based on total value of agricultural production.

[4] State ranked based on size of population.

[5] Nationwide in 1992, 14.5 percent of the population lived below the poverty line.

- Most SHAs have not allocated enough staff time and other resources to meet the requirements of developing and sustaining effective State and local coalitions.
- Developing partnerships within and among public agencies can be just as challenging as building effective linkages to the private sector.

Leadership Factors

- Effective leadership combines elements such as strategic planning, careful attention to nurturing personal ties, and adaptation to changing group needs without losing sight of the Program's larger goals. It is vitally important that leaders diagnose and understand the dynamics of their environment and adapt their leadership accordingly.
- Although State 5 A Day programs are constrained by environmental and organizational factors over which they have little control, leadership can and does make a difference.

Wider Public/Private Partnership Factors

- Enlisting the support and participation of prestigious medical and research institutions can help build the Program's credibility, visibility, and attractiveness to partners in both the public and private sectors.
- The most effective public/private partnerships include key industry organizations that integrate different constituencies and that serve as a natural bridge between the public- and private-sector participants. State and local health departments that have built the most successful public/private partnerships have made special efforts to learn about, and adapt to, the culture of the local produce industry in their communities.

Media Analysis

To assess the impact and use of media tactics and materials, the 5 A Day Program conducts media content analyses called the Media Analysis System

for Health (MASH). The MASH studies employ standard content analysis methodology that includes the use of coding structures, trained readers, data collection, tabulation of the coding sheets, and an analysis of the findings. In addition to providing insight into the effectiveness of media outreach, MASH findings also have helped identify campaign elements that need to be revised. Several MASH studies have been conducted, including one in 1993, two in 1994, and one each in 1995 and 1998. Chapter 6 includes examples of findings from some of these studies.

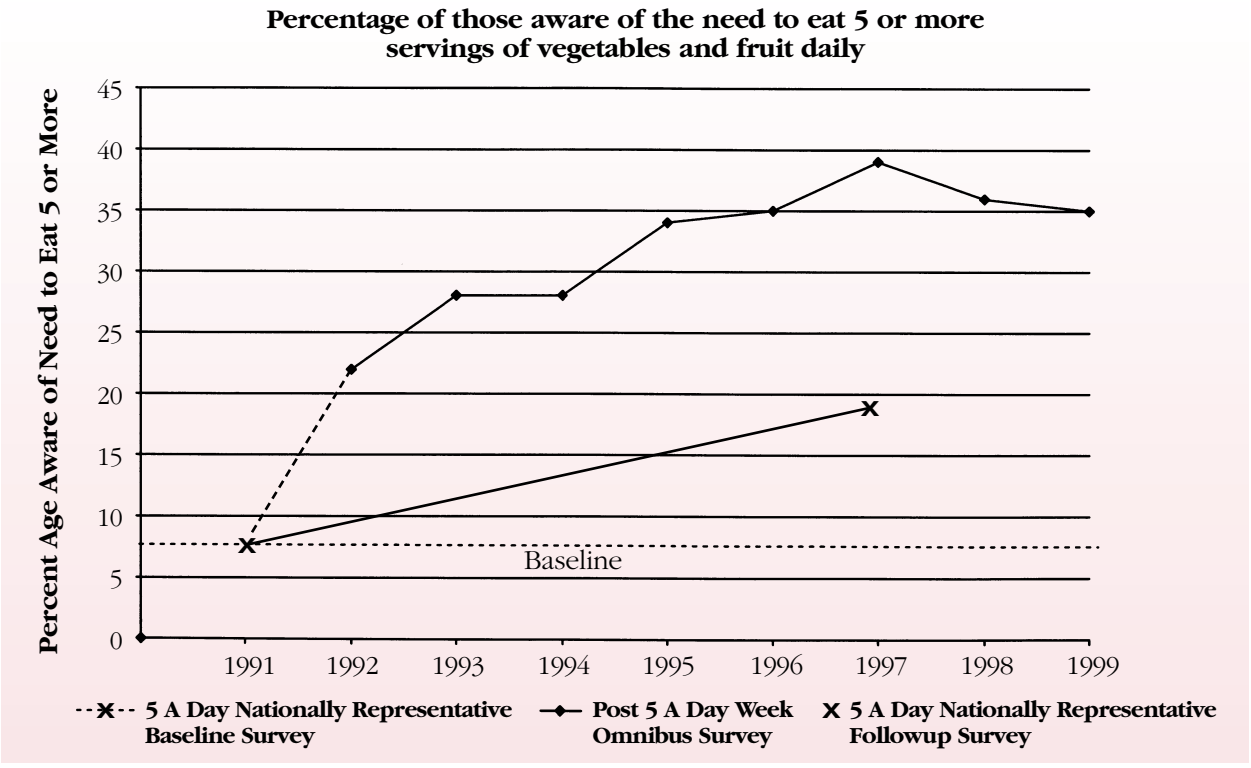
LEVEL II—OUTCOME EVALUATION

The outcome evaluation includes a number of components, including measures of awareness; a limited number of State-level, 1-year evaluation grants; the 5 A Day baseline and followup national surveys; and the nine funded randomized trials.

5 A Day Message Awareness

Several surveys were conducted to assess target audience awareness of the 5 A Day message. In August 1991, NCI and PBH jointly fielded a baseline telephone survey of approximately 3,000 Americans. Results of this survey showed that only 8 percent of Americans knew that they need to eat five or more servings of vegetables and fruit daily. In July 1992, NCI launched the 5 A Day media campaign. An omnibus survey done 2 weeks after the media launch revealed that 22 percent of respondents were aware of the recommended number of daily servings for vegetables and fruit. A survey conducted in 1997 showed that general awareness of the 5 A Day message had increased to 39 percent (see Figure 5). Among women specifically, awareness of the Program message has increased from 11 percent at baseline (1991) to 50 percent (1998). Positive awareness change or consciousness-raising is the first step among the processes of change. All indications show that adult awareness of the 5 A Day message increased sharply in the early years of the campaign, with a slower increase then slight decline in recent years. The overall objectives of the 5 A Day Program were to increase awareness of the 5 A Day message and to provide consumers with specific information about how to include more servings of vegetables and fruit. Message

Figure 5. Evaluating Public Awareness Over Time



awareness has increased, which theoretically provides the basis for behavior change to occur.

Evaluation of State-Level Interventions

To evaluate State-generated 5 A Day interventions, the national 5 A Day Program established an agreement with CDC to award and monitor grants to SHAs that evaluate 5 A Day interventions within specific community channels. The primary purpose of this interagency effort is to evaluate State-developed interventions designed to promote increased consumption of vegetables and fruit and to fulfill part of the evaluation component of the 5 A Day Program. This research demonstrates how interventions are implemented in real-life community settings by public health departments with moderate budgets. Although these program evaluation designs were as rigorous as possible, in practice they are less rigorous than controlled research designs. Randomization was not always possible in these program evaluation projects; therefore, quasi-experimental research methods were often employed. Research capabilities were limited, principally because of limited funding and timeframes (1 year). Therefore, less extensive data were collected in these projects compared with the more generously funded randomized studies discussed below. The interagency agreement process was selected because CDC can support State-directed interventions of this nature and has the mechanism in place to carry out this effort efficiently.

An RFP (request for proposal) is developed each year to solicit proposed evaluation plans for a clearly defined study from an established, licensed 5 A Day participant, with long-range potential in one or more specific community channels. The evaluation plan must contain clear, measurable evaluation objectives, and expected outcomes should be defined with appropriate statistical power. Use of behavior change theoretical frameworks is desired to guide the evaluation study.

CDC, in collaboration with NCI, awarded 31 competitive 5 A Day grants to licensed State agencies between September 1995 and September 1999. The funds support annual projects to evaluate 5 A Day nutrition intervention programs in specific community channels (e.g., school, retail, media, and worksite). An overview of the type of channel targeted and the status of each evaluation grant is provided in Table 3.

Table 3. Channel-Specific NCI/CDC Evaluation Grant Summary, 1994-1999

Channel	*Number of Grants*	*$ Average/ Grant*	*Partnerships* (University/Not-for-Profit/For-Profit)*	*Nature of Evaluation** (Process/Outcome)*	*Results Available (Process/ Outcome**)*	*Followup Dissemination Activities****
Schools	15	83,384	10/4/1	15/13	6/5	6
Food Assistance Programs (farmers markets; WIC)	6	71,418	5/1/0	6/2	6/2	2
Media	4	81,678	2/2/0	4/4	1/1	1
Groceries	4	80,920	2/2/0	4/1	1/1	0
Worksites	2	70,598	2/0/0	2/1	0/0	0

* The State department of health (SDH) serves as the primary funded institute. The 5 A Day State coordinator serves as the primary investigator. Partnerships are usually established between the SDH and State/regional universities or not-for-profit or for-profit agencies.
Not-for-profit = Schools; other State health agencies; and private, not-for-profit agencies, such as the American Cancer Society.
For-profit = Private institutions, such as the Cooper Institute in Texas.

** Process = Evaluation of program implementation and participation of subjects within the study design.
Outcome = Evaluation of the programs' impact on subjects' knowledge, attitudes, and/or vegetable and fruit consumption.

*** Followup dissemination activities = Continuation of 5 A Day evaluation projects by States via expansion or dissemination and use of funding sources beyond NCI/CDC grants.

The nature and scope of these grantee programs are broad within their respective communities. The majority of the projects focus on low-income, ethnically diverse population groups within the community. Efforts aimed at Hispanics and African-Americans have been conducted to develop culturally appropriate strategies for encouraging the consumption of five or more servings of vegetables and fruit daily. The State-level grants are one mechanism that NCI and CDC have used to evaluate and strengthen States' efforts in conducting effective programs to reach specific high-need groups.

Most of the States were able to successfully conduct the research project as described within the grant application. The California and Kansas departments of health already had the expertise among their own staff members to appropriately design and conduct a study. Almost every other State used consultants or contracted part of the research components (e.g., materials development, data collection, and data assessment) to outside collaborators, such as local universities or other State agencies. States often made key staff available as in-kind support to the grant recipients, enabling the State agencies to utilize grant dollars to contract with additional collaborators and resources outside the State agency.

Of the 31 grants funded as of 1999, 12 grants have been completed, 9 grants received no-cost extensions through December 1999, 4 grants failed to complete the research proposal due to a variety of circumstances (loss of staff, subject recruitment issues, failure of compliance, or high subject dropout rates), and 6 grants awarded in the fiscal year 2000 funding cycle were completed.

Results of State-Level Interventions

There have been several peer-reviewed articles, including those by Foerster and colleagues (1998), Anderson (2000), Auld and colleagues (1998, 1999), and Romaniello (2000), as well as presentations at professional meetings, that report the outcome results of the completed evaluation grants. In addition, States have used the evaluation grant data as a turnkey for developing and expanding a State-level program on a wider scale and for obtaining additional program support from sources beyond NCI (see Chapter 4 for examples). Several States, such as California, Kansas, Colorado, and Utah, have used the data and results from their grants to obtain further grant funding from within and outside of NCI. Data generated from the NCI/CDC 5 A Day evaluation grants have served as pilot data for further research, and these data have been used to obtain additional funding. Alternative funding sources have enabled select States to continue community-based intervention, evaluation, and dissemination research or to build a wider scale intervention into school programs, as well as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)/farmers market-based programs within the State. See Table 2 for more details.

The lessons learned from this effort indicate that a vigorous evaluation design is essential for successful assessment and completion of the State evaluation grant. With the appropriate support mechanisms in place, a strong campaign is able to reach its targeted population regardless of channel base (e.g., media, school, food assistance program). Study data, along with State BRFSS data, have been used to monitor ethnic population subgroups and to assess continuing changes in vegetable and fruit consumption data over time.

In school-based programs, success is most often attributed to certain aspects of the program design, such as using educational theories that focus on children's learning styles, using special resource teachers or other trained providers to ensure fidelity to the Program objectives and provide quality educational opportunities, and using multiple activities in the lunchroom to augment classroom activities.

Use of food assistance coupons, such as farmers market coupons, combined with educational opportunities that are interesting and relevant to the targeted population group, help to increase the fruit and vegetable intake of WIC participants. Educators may improve participant response rates from low-income clients by using such techniques as reminder cards and followup phone calls and by coordinating research data collection with regularly scheduled clinic appointments.

Preliminary data on point-of-purchase (grocery store) and worksite interventions indicate that recruitment and followup with the targeted population group are most challenging within these sites, making evaluation of the intervention exposure very problematic. Participation in point-of-

purchase programs is often limited to the chance encounter off the street, with minimal ability for followup. Depending on the worksite or grocery store site, subject recruitment can be restricted, and evaluation of the extent of exposure and participation may be difficult to obtain. Furthermore, programs targeting these channels may be effective in improving the targeted population groups' awareness of the need for consuming five or more servings of vegetables and fruit daily but may lack definitive measures of actual impact on consumption.

Baseline and Followup Surveys

The 5 A Day baseline survey was conducted in the fall of 1991 before the launch of the national program. It was a random-digit-dial telephone survey designed to be representative of the adult U.S. population. The intent was to collect information about the usual intake of vegetables and fruit as well as related data regarding knowledge, attitudes, demographics, and stages of change. Understanding the demographics and psychosocial, stages-of-change, and lifestyle characteristics of people, in turn, can aid in the development and evaluation of appropriately targeted messages.

The findings from the 5 A Day baseline survey represented the first national data on vegetable and fruit consumption to be reported since 1985. The survey showed that the median daily intake of total vegetables and fruit for the total population was 3.4 servings per day (Subar et al., 1995). Linear regressions showed that intake increased with education, income, and nonsmoking status. Women had higher intake rates than men at all ages; these differences between men and women increased with age. Vegetable and fruit consumption increased with age for Whites and Hispanics, but not for African-Americans. Psychosocial factors (Krebs-Smith et al., 1995) and stages of change (Van Duyn et al., 1998) associated with vegetable and fruit consumption were also characterized from the baseline survey. Krebs-Smith and colleagues estimated that only 8 percent of American adults thought that five or more servings of vegetables and fruit were needed for good health. Of all the factors studied, the most important in predicting vegetable and fruit intake were the number of servings that one thought should be consumed in a day, whether one liked the taste of vegetables and fruit, and whether one had been in the habit of eating vegetables and fruit since childhood. These factors accounted for 15 percent more of the variation in vegetable and fruit consumption than did demographic variables alone. Building and expanding upon these results, Van Duyn and colleagues found that stages of change and knowing the number of servings one should eat for good health provided the most parsimonious model, explaining 25 percent of the variance in total vegetable and fruit intake compared with 29 percent for the full model. Persons in the higher stages of maintenance reported intakes that met national dietary recommendations of five or more servings of vegetables and fruit daily, and those in the action stages reported intakes that closely approached this level. This finding suggests that people in the highest stage, maintenance, can serve as a referent group, providing insights into how people can successfully make and maintain dietary changes.

A followup survey was conducted in the autumn of 1997 to measure 6-year trends in vegetable and fruit intake rates as well as in knowledge, attitudes, and beliefs about diet and nutrition with respect to vegetables and fruit. Weighted, unadjusted mean intake of total vegetables and fruit increased from 3.75 servings in 1991 to 3.98 servings in 1997. These preliminary data show a modest, positive increase in overall vegetable and fruit consumption in adults, not adjusting for demographics. Complete results of the followup survey were submitted to the *Journal of the American Dietetic Association* in 2001.

Channel-Specific Community Research Grants

In addition to baseline and followup survey data on vegetable and fruit consumption, the outcome evaluation component of the 5 A Day Program includes nine research project grants that were funded by NCI in May 1993. These 4-year research project grants with randomized designs were funded to provide the most rigorous measures of the effectiveness of 5 A Day behavioral change interventions in increasing consumption of vegetables and fruit. The nine research projects were conducted in various community channels—four were based in schools, three at worksites, one in church, and one in food assistance programs. Eight of the nine research projects achieved

significant ($p < 0.05$) positive results in increasing vegetable and fruit consumption in the intervention versus control participants. Increases in mean vegetable and fruit consumption ranged from 0.2 serving up to 1.7 servings daily (see Table 4). Results are reported in Chapters 9 through 11.

SUMMARY

All evaluation components combined have shown positive trends in Program growth and effectiveness. Level I, process evaluation, indicated that the Program grew well and rapidly, incorporating both industry and State licensees. State participation has been maintained at a consistently high level. Industry participation has varied as the market structure has shifted. Renewed efforts need to be made at both the national and State levels to enhance public/private partnership initiatives. In a planned strategy, the Program grew over time to include new collaborators, such as the U.S. military, American Dietetic Association, American Cancer Society, and USDA, as well as CDC.

Process evaluation also indicated excellent and continuing broadcast and print media coverage of the Program. Coverage in the news and trade press increased whenever new data, such as results of the baseline survey, were made available. Case studies of the State programs revealed that efforts were enhanced by support from professionals at high levels within the health departments as well as by good leadership, cultivation of good relationships with industry, and adequate human resources.

Level II, outcome evaluation, indicated that media efforts were effective in increasing awareness of the Program's message. Initiatives implemented by State coalitions, or a subset of their members organizations with minimal resources can be effective in increasing consumption of vegetables and fruit in a variety of settings or channels. The more successful programs have been conducted in schools, in the WIC Program, and through the media. It has been more difficult to show effect in point-of-purchase programs and at worksites.

Outcome evaluation also has shown that randomized, channel-specific 5 A Day interventions based on behavioral change theories result in positive changes in vegetable and fruit consumption and behavioral correlates. These studies provide the strongest evidence that the 5 A Day Program can increase vegetable and fruit consumption. In addition, the baseline and followup national surveys indicated that national consumption has increased during the life of the 5 A Day Program and that this

Table 4. Nine Community-Based 5 A Day Research Projects—Main Effects

Research Site	*Channel*	*Fruit and Vegetable Consumption – Positive Main Effects*
University of Alabama	Elementary school	1.68 servings ($p < 0.0001$)
Emory University	Elementary school	0.2 serving ($p = 0.05$)
Tulane University	High school	0.37 serving ($p < 0.001$)
Minnesota Department of Health	Elementary school	0.26 serving of vegetables for girls at lunch ($p < 0.05$)
University of Arizona	Worksite	0.46 serving ($p < 0.002$)
Dana-Farber Cancer Center	Worksite	Worksites and family, 0.55 serving ($p = 0.05$)
Fred Hutchinson Cancer Research Center	Worksite	0.3 serving ($p = 0.06$)
North Carolina Department of Health	Church	0.85 serving ($p < 0.0001$)
University of Maryland	WIC	0.43 serving ($p = 0.002$)

trend is associated with awareness of the Program and its message. All evaluation indicators support the conclusion that the Program has been successful in increasing public awareness of the 5 A Day message, and has contributed to the national increase in vegetable and fruit consumption.

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